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(72) Inventor(s):
Same as patentee

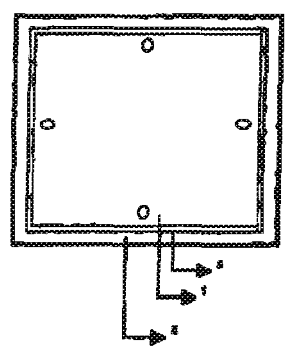
(56) Printed documents to be considered in assessing patentability:

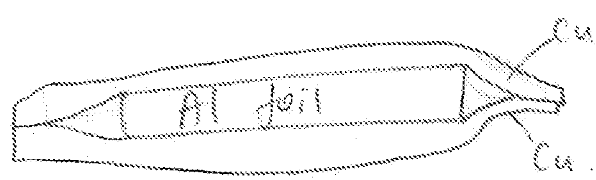
DE	35 07 568 C2
DE	41 16 543 A1
DE	38 44 498 A1
DE	31 31 688 A1
US	51 60 567 A

HUSCHKA, Manfred: Introduction to Multilayer Press Technology, Saulgau/Württ: Eugen Leuze Verlag 1988;

(54) Method for the partial joining of copper foils and sheet metal separators (CuAl Method)

(57) The method relates to the joining of copper foils of any type and thickness to aluminum sheet metal of any type of alloy and of any thickness to simplify the assembly of multilayered press packs, by joining two copper foils of any type and thickness and an aluminum sheet of any type of alloy and of any thickness to one another so that this joint lies outside the useful area. At the same time, the positioning holes necessary for the platen press are produced. The copper foils used are somewhat larger than the aluminum sheet. When the aluminum sheets clamped between the copper foils are placed together with epoxy resin fabric in a platen press for multilayer pressing, the aluminum sheet can expand freely when heated without causing surface stresses on the copper foil. When the epoxy resin melts, it can flow along the projecting copper foil without coming into contact with the aluminum sheet and without cementing the multilayered area. The projecting copper margin with the adhesive can then be easily separated along the aluminum sheet.





DE 198 31 461 C 1

Specification

This invention relates to a method for joining copper foils and sheet metal separators for pressing multilayered printed circuit boards.

It is known that the two outside layers of a multilayered printed circuit board are provided with copper foils over their entire area, which are laminated to the particular pack in the lamination process using the underlying prepreg layer (a fiberglass fabric saturated with epoxy resin). The final circuit image is then etched from these foils. The copper foil has to be free of impressions, scratches, or bumps. This uniformity is achieved when sheet metal separators with a smooth surface are used. Thus several layers can also be pressed at the same time.

The printed circuit boards are pressed in platen or vacuum presses, with the copper foils being pressed with the prepreg under pressure while heated at about 180 degrees Celsius, and then forming an inseparable composite with the pack of internal layers.

According to DE 38 44 498 A1, warping of the pressed multilayered pack and with it an uneven copper surface are prevented by performing the pressing by using vacuum and an isostatic pressing technique. Additional thermally insulated plates mounted to float are then introduced, and keep the press platens cool during the heating of the multilayered pack.

It is a drawback to this method that a pack of identical area and thickness has to be on each tool plate, so that epoxy resin escaping during the heating can cement the edges of the multilayered board.

According to DE 35 07 568 C2, slippage of the prepreg layers is prevented by a slip guard, but this can prevent any possible emergence of the prepreg at the sides of the pack only when the copper foils used are somewhat larger than the other layers, so that the prepreg can run out on them. It is a drawback in this case that stainless steel conducts heat poorly, so that longer heating is necessary. The heat penetration is also less uniform than with aluminum sheets, for example.

The method according to DE 41 16 543 A1 uses a steel sheet separator with an elevated coefficient of thermal expansion of $16 \cdot 10^{-6}$ per degree Celsius, which thereby approximates the coefficient of thermal expansion of copper. This very largely prevents surface stresses, but the heating time for the stainless steel sheet is still just as long.

For these reasons, aluminum sheets are being used more and more often; they conduct heat better and more uniformly.

Furthermore, in all of the methods mentioned above, the copper film and the corresponding sheet metal separator have to be assembled manually into a pack with the other layers by specially trained personnel in a laying room (cf. Manfred Huschka, "Introduction to Multilayer Pressing Technology," Eugen G. Leuze Verlag, 1988, Chapter 3). The frequently very thin and therefore sensitive copper foils can quickly become crushed.

The method according to DE 31 31 688 A1 describes only the production of an aluminum sheet/copper composite. However, separate handling of copper foil is not addressed there.

In the following laminating process, there is also a risk that rather severe surface stresses are produced from the cementing, because of the different coefficients of thermal expansion of copper and aluminum. Aluminum expands much sooner than copper. Furthermore, cementing can occur at the edges of the pack here also, after the epoxy resin melts.

The method according to US Patent 5,160,567 is also concerned with the production of laminates. In this case the pressed metal sheets are covered on both sides with projecting copper foil, with the copper foils then being joined to one another in the marginal area of the pressed metal sheet.

The use of the stainless steel sheet here is a drawback, since the heat is conducted more poorly than in the case of aluminum sheets, and thus it has to be heated longer. In addition, the copper foil here also has to be laid down separately, which is possible only with difficulty without wrinkling with suitably thin foils.

Therefore, the underlying purpose of the invention is to develop a method that both prevents and/or largely avoids cementing of pressed layers and also prevents deformation of the copper foil in various operating steps.

This task is accomplished pursuant to the invention by the features of Patent Claim 1.

These measures achieve the result that when laying the press pack, the copper foil no longer has to be mounted separately and possibly creased in the process. The foil stays stretched flat above the sheet metal, so that even very thin copper foils can be chosen. If positioning holes are punched immediately after the edging, then this prevents the copper foil from being shifted and damaged during another operating procedure, namely punching the positioning holes.

To prepare for the multilayer pressing process, the aluminum sheet covered with the copper foil and provided with register holes then only has to be laid on the prepreg in one operating procedure.

The aluminum sheet can expand unhindered during the pressing process, and can break through the copper foil combination under some circumstances, without causing surface stresses on the copper. When the epoxy resin flows out under the copper, it can run along the projecting copper foil without coming in contact with the aluminum sheet.

The projecting margin of the copper foils with the adhesive residues can then be separated at the edge of the aluminum sheet and thus outside the useful area. Mechanical joining of the copper foils, for example by punching or stamping, then makes possible unhindered expansion of the sheet metal, so that the escaping resin can be better distributed because no more stresses exist on the surface.

Cementing the projecting copper margin assures long-term joining, so that sheet metal separators covered over with copper can be stored for a longer time.

Thermal joining of the copper foils, for example by soldering or welding, also permits the unhindered expansion of the metal sheet. Which form of joining is selected depends critically on cost.

The example of embodiment will be discussed with reference to Figs. 1 and 2.

Fig. 1 shows an (aluminum) sheet metal separator provided with positioning holes of a given size 1, which is covered on both sides with a larger copper foil 2. The copper foils are then joined at a point outside the area of the sheet metal separator, but with some copper foil still projecting 3.

Fig. 2 shows the sheet metal separator covered on both

sides with the copper foils. The expanded aluminum sheet has broken through the joint 1. The copper foil beneath it is pressed smoothly with the inner layers in the useful surface area 2. The epoxy resin that has run out cements at the projecting margin of the copper foil 3.

To that extent it involves a new composite material that takes into account the properties of the individual components, better thermal conductivity and sharply different coefficients of thermal expansion.

Patent Claims

1. Method for the partial joining of copper foils of any type and thickness to aluminum sheet metal of any type of alloy and thickness foreseen in the lamination of multilayered printed circuit board press packs, by
   - laying the copper foils on both sides of the Al press sheet, with the dimensions of the copper foils being larger than those of the press sheet, so that they extend beyond the press sheet on all sides and lie tightly against it, and
   - positive joining of the projecting copper foils with simultaneous introduction of the register holes, so that a free area is left between the Al press sheet and the joined points, to absorb the expansion of the press sheet caused by heat.
2. Method pursuant to Claim 1, characterized by the fact that the copper foils are cemented to one another.
3. Method pursuant to Claim 1, characterized by the fact that the copper foils are joined to one another by soldering or welding.

1 page of drawings attached hereto

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Figure 1

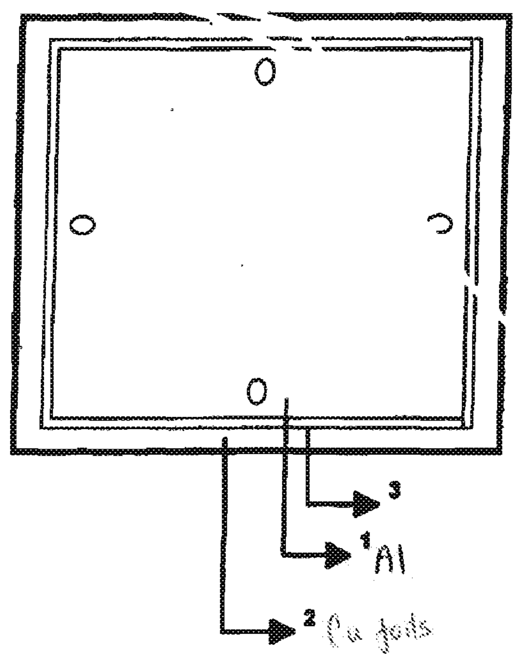
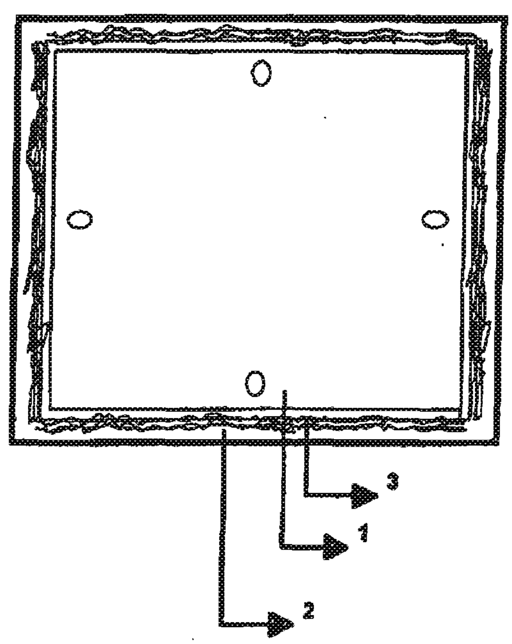


Figure 2



PATENT SPECIFICATION (11) **1 458 712**

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1 458 712

Same inventor as Sato

(54) METHOD FOR MANUFACTURING METAL FOIL OR PLASTIC FILM-OVERLAID LAMINATE

(71) We, MITSUBISHI GAS CHEMICAL COMPANY, INC., a corporation organised under the laws of Japan, of 5-2, Marunouchi-2-chome, Chiyoda-Ku, Tokyo, Japan, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a method for manufacturing a metal foil- or plastic film-overlaid laminate, for use in printed circuit board, electrical insulation material, and the like.

This invention is concerned with a method for manufacturing the above-mentioned metal foil- or plastic film-overlaid laminate with a smooth and flawless surface of the metal foil or plastics film overlay by keeping dust and other fine particles completely out of access to the interface between the pressing surface of the press plate and the face side of said metal foil or plastic film before lamination is finished, since otherwise these particles tend to cause depressions, which are called dents, on the surface of the metal foil or plastic film layer after lamination.

The metal foil- or plastic film-overlaid laminate has generally been manufactured by the following process:

A cleaned metal foil or plastic film is applied to one or both sides of a laminating base, such as a plastic sheet, a reinforced plastic sheet or a prepreg, in such a manner that the laminating base is in intimate contact with the back side of the metal foil or plastic film. The resulting assembly is then placed between a pair of press plates. In some cases, a plastic film is placed between the press plate and the resulting assembly. After such a preparatory assembling step, laminating is carried out with heating under pressure.

In such a conventional laminating procedure, the press plate, metal foil and plastic film are, of course, cleaned to be dust-free before use. The dust particles suspended in the surrounding air, the loose fibers from the garments of workers, the dust from machines and apparatus, and dust from the laminating base, and other foreign solid matters may deposit on the surface of press plate or metal foil or plastic film during the assembling step or during transportation of the assembly. On being laminated, these deposited dust particles cause pits and dents on the surface of the metal foil- or plastic film-overlaid laminate. It may be, of course, possible to decrease the occurrence of pits and dents by dust-proofing the working room and working environment, cleaning the garments of workers, installing a dust-catcher for machines and materials, and other appropriate measures, particularly by giving due consideration to handling of the laminating base, press plate, and metal foil or plastic film. However, since it is practically impossible to eliminate dust particles originated from fragments and chips produced from the laminating base itself during assemblage or handling, it has been difficult to manufacture a metal foil- or plastic film-overlaid laminate having a flawless surface.

The pits and dents are of various sizes including small ones as well as large ones in accordance with the sizes of dust particles. Those pits and dents of large sizes which are clearly noticeable are detrimental to the commercial value of the product, whilst those of very small sizes which are not easily detectable can escape through the barrier of visual inspection and remain on the commercial product.

According to this invention, there is provided a method for manufacturing a metal foil- or plastic film-overlaid laminate, which comprises completely covers at least one surface a cleaned press plate with at least one member selected from the group consisting of cleaned metal foils and cleaned plastic films in such a manner that the press

plate comes in intimate contact with the face side of said member, partially or completely sealing the resulting covering along at least two edges of the press plate, said two edges being opposite to each other, applying the covered press plate to one or both sides of a laminating base, subjecting the resulting assembly to heating under pressure in a laminating apparatus, taking the assembly out of the laminating apparatus, and thereafter opening the covering to remove the press plate.

The metal foils may be those which are conventionally used in the production of metal-clad laminates, and include, for example, foils of aluminum, copper, nickel, zinc and alloys of at least two of these metals, copper-clad aluminum foil, copper-clad zinc foil, and copper-clad nickel foil. One or both sides of the metal foil may have been treated chemically or mechanically in a conventional manner or coated with an adhesive to bond the foil to a base. Aluminum and zinc foils may also be used as release films.

The plastic film may be those which are conventionally used in the production of metal-clad laminates and plastic film-overlaid laminates, and include, for example, cellulose acetate, cellulose acetate butyrate, polycarbonate, saturated polyesters, polytetrafluoroethylene, polyethylene terephthalate, polyvinylidene fluoride, fluorinated ethylene-propylene copolymer and the like.

Among these, polytetrafluoroethylene, fluorinated ethylene-propylene copolymer, polyethylene terephthalate and polyvinylidene fluoride are used as release film, and cellulose acetate, cellulose acetate butyrate, polycarbonate and saturated polyesters are used as both release film and overlay. The metal foil and plastic film may preferably have a thickness of 5 to 200 μ.

The laminating bases may be those which are conventionally used in the production of laminates, and include, for example, thermosetting resin-impregnated glass fabrics, glass mats, glass papers, glass-cellulose papers, cellulosic papers and synthetic and natural fiber fabrics and sheets of mixtures of a thermosetting resin with glass fiber and/or inorganic fillers. Among preferred laminating bases are epoxy resin-impregnated glass fabrics, epoxy resin impregnated glass papers, epoxy resin impregnated paper, phenolic resin impregnated paper, and polyimide impregnated glass paper. The thermosetting resin includes, for example, a phenolic resin, a melamine resin, an epoxy resin, a diallyl phthalate resin, a polyimide, a cyanate resin obtained by polymerization of an ester of cyanuric acid and an aromatic alcohol or phenol, an unsaturated polyester and a silicone resin. Further a thermoplastic sheet may also be used as the laminating base, such as a polyethylene terephthalate sheet, a polyamide-imide sheet, a polyimide sheet, a polycarbonate sheet or a polyphenylene oxide sheet.

Intervention of dust particles and other foreign matters between the press plate and the metal foil or plastic film can be prevented and, hence, occurrence of defects such as pits and dents on the surface of the metal foil- or plastic film-overlaid laminate can be prevented by enclosing a cleaned press plate with a cleaned, dust-free metal foil or plastic film in such a manner that the pressing surface of the press plate comes in intimate contact with the face side of said metal foil or film, or alternatively, placing the press plate between a pair of metal foils, such as a pair of copper foils or copper foil and aluminum foil; a pair of plastic films such as a pair of cellulose acetate films or a sheet of metal foil and a sheet of plastic film such as copper foil and cellulose acetate film which are then sealed along at least two edges of the press plate, two of the edges being opposite to each other, preferably around all edges of the press plate by bonding for example, with adhesives or adhesive tapes, caulking, sewing or welding, thus forming the covered press plate, applying the covered press plate to one or both sides of a laminating base, and subjecting the resulting assembly to heat and pressure in a laminating apparatus.

Covering of the cleaned, dust-free press plate with a metal foil or plastic film or both of them can be effected automatically under dust-free conditions by using apparatus and technique generally used in packaging of sheet-like articles with a film or in bonding a film or the like to sheet-like articles. It is necessary that the metal foil or plastic film, when used as overlay be brought into intimate contact with the press plate surface without leaving wrinkles, and that along, more desirably around, at least two edges of the press plate, the metal foil or plastic film be sealed. Covering the press plate with a metal foil and/or plastic film without leaving wrinkles can be effected by, for example, smoothening the overlay material with a levelling roll, by applying tension to the overlay material by means of clamps holding all four edges, or by other means. Sealing along the edges can be conducted by bonding the overlay material to the press plate along the edges, or by bending, caulking, or welding together the upper and lower overlay materials along the edges of the press plate.

According to this invention, moreover, the step of assembling the laminating base, the metal foil or plastic film, and the press plate can be automated. In the conventional method, as shown in Fig. 4 of the

accompanying drawing, generally a metal foil and/or plastic film is placed over a laminating base and then a press plate is placed on the overlay material. Such an assembling step can be automated only with extreme difficulty, because the metal foil and/or plastic film is apt to become wrinkled due to being very thin, requiring manual handling with the utmost care. On the contrary, according to this invention, at first the press plate is covered with the metal foil and/or plastic film, and then the covered press plate is applied to the laminating base, thus eliminating wrinkle-formation during the assembling step and making automation very easy.

The invention is further illustrated below in detail with reference to the accompanying drawings, in which Fig. 1a and Fig. 1b show an example of covering a press plate, Figs. 2a to 2f represent embodiments of sealing procedure, Fig. 3 represents an example of assembling in manufacturing a laminate overlaid, on one side, with copper foil according to this invention, Figs. 4a to 4c are schematic representations of the conventional method, and Fig. 5 is a schematic representation of a method for the automatic covering of a press plate. Fig. 1a is a plan view of the press plate covering, and Fig. 1b is a sectional view at A—A in Fig. 1a, wherein *1* is a press plate, *2* is a metal foil (as overlay), *3* is a plastic film (as release film), and *4* is an adhesive layer to serve as a seal. Figs. 2a to 2f represent various embodiments of the way of sealing after the press plate has been covered with a metal foil, a plastic film or both of them according to this invention. Fig. 2a shows a way of sealing by use of an adhesive, Fig. 2b shows a way of sealing by bending and caulking, and Fig. 2c shows a way of sealing by use of an adhesive tape. Fig. 2a and Fig. 2c show an example of covering with a plastic film (as release film) and a metal foil (as overlay), and Fig. 2b shows an example of covering with a metal foil alone. In Fig. 2a and Fig. 2c, *1* is a press plate, *2* is a metal foil, and *3* is a plastic film. In Fig. 2a, a press plate is placed between a metal foil and a plastic film, both of which are somewhat larger in size than the press plate, and the marginal portions are sealed by use of an adhesive *4*. Fig. 2c shows an example in which a press plate is placed between a metal foil and a plastic film, which are identical in size with the press plate, and the whole is sealed around all the edges by use of an adhesive tape *4*. In Fig. 2b, *1* is a press plate, *2* is a metal foil, *3* shows the bent and caulked portions, and the figure shows an example in which the press plate is covered with a pair of metal foils a little larger in size than the press plate and the marginal portions are sealed along the edges of the press plate by bending and caulking. In Fig. 2d, a press plate *1* is covered with two sheets of metal foil or plastic film *2*, and the marginal portions *3* are entirely welded. In Fig. 2f, a press plate *1* is covered with a sheet of metal foil *2*, which is folded along the edge *4* and the marginal portions *3* opposite to the folding line are partially welded. Fig. 2e is a plan view of a press plate covering, and Fig. 2f is a sectional view at B—B in Fig. 2e, wherein *1* is a press plate and *2* is a metal foil. A sheet of metal foil *2* is folded along the edge *4* and the marginal portions *3* opposite to the folding line are partially welded as shown in Figs. 2e and 2f. The remaining marginal portions of the metal foil are sewed by threads *5* as shown in Fig. 2e.

Fig. 3 shows an example of assembly in manufacturing a laminate overlaid, on one side or both sides, with a copper foil. A press plate *1* is covered, on the upper side, with a glossy aluminum foil *2* used as a release film and, on the other side, with a copper foil *3*, which has been roughened on the side to be bonded to the laminating base, the aluminum foil and the copper foil are sealed around the press plate to form a covered press plate *a*; several of the covered press plates *a* and several sheets of laminating base b_1 and b_2 are placed alternately one on the other; and the resulting assembly is pressed with heating by means of a press c.

Figs. 4a to 4c are a schematic view of a conventional assembling procedure. One side of a laminating base sheet *1* is covered with a metal foil *2*, and the other side thereof with a plastic film (as release film) *3*, as shown in Fig. 4a, then interposed between a pair of press plates *4*, as shown in Fig. 4b, and the resulting assembly is pressed by means of a press *5*, as shown in Fig. 4c. Dust particles and other foreign matters produced during transportation of the laminating base sheet *1* or in the stage shown in Fig. 4a tend to intrude between the press plate and the metal foil in the stage shown in Fig. 4b and cause surface defects of the finished laminate.

In the method of this invention, as stated above and shown in Fig. 3 as an example, a cleaned press plate is first covered automatically in a dustproof chamber with a metal foil and/or a plastic film, so that there is no chance for the dust particles and other foreign matters to deposit between the press plate and the metal foil or plastic film, unlike the case of the conventional method as shown in Fig. 4a. Consequently, dents and pits on the surface of finished laminates will not occur in the method of this invention even when an assembly of multiple alternate plies of the laminating

base sheets and the press plates is subjected to a laminating apparatus.

In Fig. 5 is shown an example of flow diagram of the automatic process for covering a press plate with an overlay metal foil and a release metal foil (aluminum), both foils being a little larger in width than the press plate. A release metal foil (aluminum) *1* from a stock wound on a reel is fed by means of a pair of forwarding rolls *2* onto an automatically operated conveyor belting *3*. A press plate *4* is automatically placed on the travelling release metal foil by means of a press plate handling device *5*. An adhesive is applied by means of an adhesive coater *6* to the release metal foil along at least two edges of the placed press plate. Another metal foil *7* for use as an overlay is fed from a metal foil feeder over the press plate and passes under a leveling roll 8. Both the release metal foil and the overlay metal foil are cut by means of a press-bonding and cutting device *9* to obtain the individual press plate *10* covered, on one side, with the release metal foil and, on the other side, with the overlay metal foil. Under such operating conditions, dust particles and other foreign matters have no chance to deposit between the press plate and the metal foil for use as overlay. Pairs of the covered press plates and the laminating base sheets are piled so that the overlay metal foil is interposed between each pair to form an assembly, which is then subjected to a laminating apparatus. The covering is thereafter opened to remove the press plate, leaving behind a metal-clad laminate, which has a smooth surface without even a minute dent.

A not continuous

WHAT WE CLAIM IS:—

1. A method for manufacturing a metal foil- or plastic film-overlaid laminate, which comprises completely covering at least one surface of a cleaned press plate with at least one member selected from the group consisting of cleaned metal foils and cleaned plastic films, in such a manner that the pressing surface of the press plate comes in intimate contact with the face side of said member, partially or completely sealing the resulting covering along at least two edges of the press plate, said two edges being opposite to each other, applying the covered press plate to one or both sides of a laminating base, subjecting the resulting assembly to heating under pressure in a laminating apparatus, taking the assembly out of the laminating apparatus, and thereafter opening the covering to remove the press plate.

2. A method according to Claim 1, wherein the covering is sealed with an adhesive, or an adhesive tape.

3. A method according to Claim 1, wherein the covering is sealed by bending, caulking, sewing or welding.

4. A method according to any of the preceding claims, wherein the metal foil is a foil of copper, aluminum, nickel, zinc, or an alloy of at least two of these metals, or copper-clad aluminum foil, copper-clad zinc foil or copper-clad nickel foil.

5. A method according to Claim 4, wherein the metal foil has been treated chemically or mechanically on one or both sides or coated with an adhesive for bonding the foil to a base.

6. A method according to any of the preceeding claims, wherein the plastic film is a film of cellulose acetate, cellulose acetate butyrate, polycarbonate, saturated polyester, polytetrafluoroethylene, polyethylene terephthalate, polyvinylidene fluoride, or fluorinated ethylenepropylene copolymer.

7. A method according to any of the preceeding claims, wherein the laminating base is a thermosetting resin-impregnated glass fabric, glass mat, glass paper, glass-cellulose paper, cellulosic paper, or synthetic or natural fiber fabric or a sheet of a mixture of a thermosetting resin with glass fiber and/or inorganic filler.

8. A method according to any of claims 1 to 6, wherein the laminating base is a thermoplastic sheet.

9. A method according to Claim 7, wherein the thermosetting resin is a phenolic resin, melamine resin, epoxy resin, diallyl phthalate resin, polyimide, resin obtained by polymerisation of an ester of cyanuric acid and an aromatic alcohol or phenol; unsaturated polyester or silicone resin.

10. A method according to Claim 7, wherein the laminating base is an epoxy resin-impregnated glass fabric.

11. A method according to Claim 8, wherein the thermoplastic sheet is a sheet of polyethylene terephthalate, polyamide-imide, polyimide, polycarbonate, or polyphenylene oxide.

12. A method according to Claim 1, wherein the press plate is sealed between a pair of copper foils.

13. A method according to Claim 1, wherein the press plate is sealed between a pair of cellulose acetate films.

14. A method according to Claim 1, wherein the press plate is sealed between a copper foil and an aluminum foil.

15. A method according to Claim 1, wherein the press plate is sealed between a copper foil and a cellulose acetate film.

16. A method for the manufacture of

a metal foil or plastic film-overlaid laminate substantially as hereinbefore described with reference to the accompanying drawings.

17. A metal foil or plastic film overlaid laminate whenever obtained by the method of any one of the preceding claims.

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from which copies may be obtained.

1458712 COMPLETE SPECIFICATION

3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

FIG. 1a

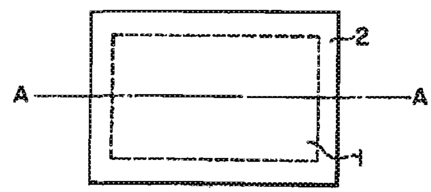


FIG. 1b

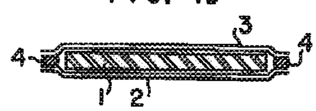


FIG. 2a

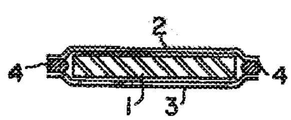


FIG. 2b

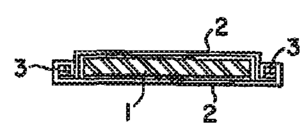


FIG. 2c

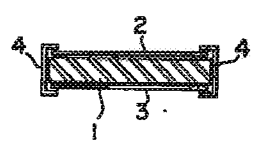


FIG. 1a

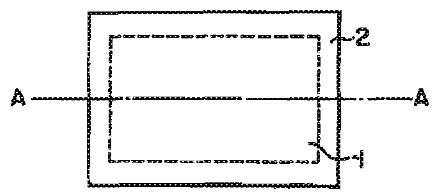


FIG. 1b

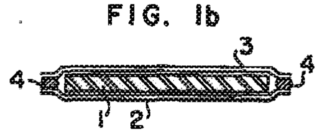


FIG. 2a

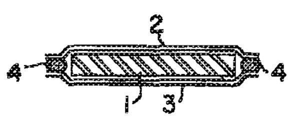


FIG. 2b

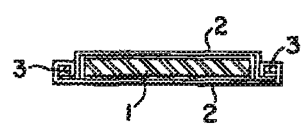


FIG. 2c

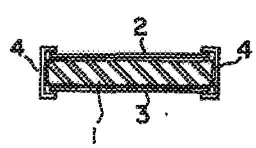


FIG. 2d

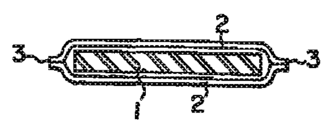


FIG. 2e

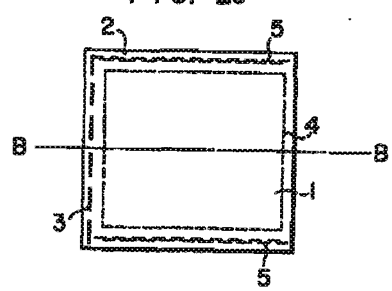


FIG. 2f

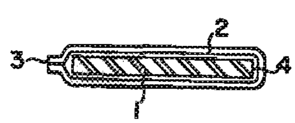


FIG. 3

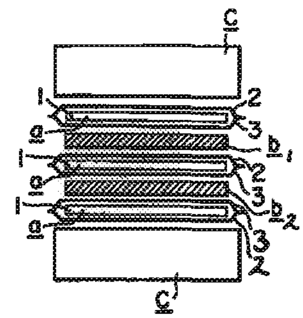


FIG. 4a

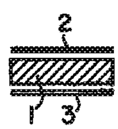


FIG. 4b

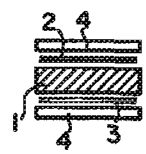


FIG. 4c

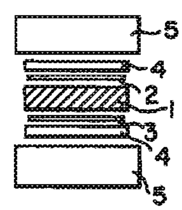
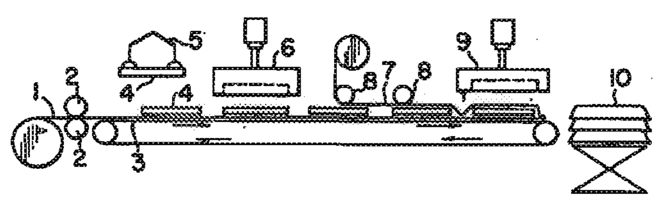


FIG. 5



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(12) (19) (CA) **Demande-Application**

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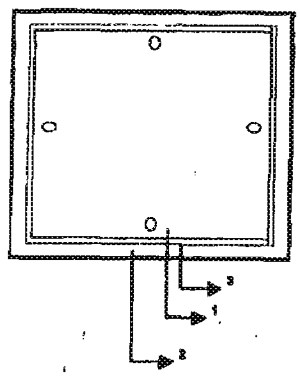
(86) 1999/07/05
(87) 2000/01/27

(72) BACKHAUS, DIETER, DE
(71) COPPER TO COPPER NORTH AMERICA, LLC, US
(51) Int.Cl.^{7} H05K 3/02
(30) 1998/07/14 (198 31 461.2) DE

(54) **PROCEDE DE LIAISON DE FILMS EN CUIVRE ET DE TOLES DE SEPARATION**

(54) **METHOD FOR JOINING COPPER FILMS AND SEPARATING SHEETS OF METAL**



(57) L'invention concerne la liaison de films en cuivre de type et d'épaisseur quelconques et de tôles d'aluminium d'alliage et d'épaisseur quelconques, permettant de simplifier l'assemblage de paquets comprimés multicouche, par application des films de cuivre sur les deux faces de la tôle d'aluminium, les films de cuivre sont plus grands que la tôle, et par assemblage par liaison de matière des films en dehors des surfaces utiles afin de laisser un espace libre réservé à l'expansion thermique de la tôle. Simultanément, les trous de position nécessaires sont pratiqués dans la presse à plusieurs étages. On choisit les films de cuivre un peu plus grands que la tôle d'aluminium. Si les tôles d'aluminium flanquées des films de cuivre sont posées dans une presse à plusieurs étages avec des toiles en résine époxy pour la compression du multicouche, la tôle d'aluminium peut se dilater librement pendant le chauffage, sans provoquer de tensions superficielles sur le film de cuivre. Dès que la résine époxy se dissout, elle peut couler le long du film de cuivre qui dépasse sans entrer en contact avec la tôle d'aluminium et sans coller au multicouche. Le bord de cuivre dépassant et enduit de colle peut être facilement séparé le long de la tôle d'aluminium.

(57) The invention relates to a method for joining copper films of any particular type and thickness to aluminium metal sheets of any particular type of alloy and thickness in order to simplify assembly of multilayer press packets. The copper films are placed upon both sides of the aluminium metal sheet. Said copper films are larger than the metal sheet. The films are connected in material fit outside the useful surface, leaving a free space for thermal expansion of the sheet metal. Simultaneously, positioning holes are created for the multiplaten press. The copper films are selected in such a way that they are larger than the aluminium metal sheet. When the aluminium metal sheets are re-clamped with the copper film and placed in the multiplaten press together with epoxy resin fabric for multilayer pressing, the aluminium can expand in an unrestricted manner during heating without causing surface tensions to occur on the copper film. As soon as the epoxy resin dissolves, it can flow along the salient copper film without coming into contact with the aluminium metal sheet and covering the multilayer with adhesive. The salient edge of the copper provided with adhesive can then be easily separated along the aluminium sheet.